

Observations of Phenomena of Jupiter's Satellites, made at Windsor, New South Wales, in the year 1886.  
By John Tebbutt.

I send herewith my observations of phenomena of Jupiter's satellites during the current year. The Fellows will, doubtless, be glad to learn that I have added to my Observatory appliances a fine Equatorial Refractor of 8 inches aperture, with which I propose to continue not only the observations of the eclipses but also those of the transits and occultations. My telescope of 4½ inches aperture was hardly equal to the work of observing the two last-mentioned phenomena. I also intend to follow more extensively the work of double star observation. The large Equatorial, which is driven by clockwork, was constructed by Grubb, of Dublin, for the late Dr. Bone, of Castlemaine, Victoria, and its object-glass, both from Mr. Ellery's and my own short experience with it, appears to be one of great excellence. In the accompanying table the telescope with which each observation was made is distinguished by the initial letter of the maker's name. C. and G. denote the Cooke and Grubb Equatorials of 4½ and 8 inches aperture respectively.

Mr. Tebbutt, Observations of

XLVII. I,

Phenomena of Jupiter's Satellites.

Day of Obs.	Sat.	Phenomena.	Phase.	Telescope.	Tower.	Windsor Mean Time. h m s	Correction to N. Almanac. m. s
March 28	I.	Ecl. R.	First seen	C.	180	13 30 15.8	+ 1 26.0
28	I.	"	Full brightness	"	"	13 31 37.1	
28	IV.	"	Last seen	"	130	14 38 32.9	- 15 34.9
28	IV.	Ecl. R.	First seen	"	"	16 28 4.7	+ 8 53.9
April 1	III.	"	First seen	"	180	6 55 19.2	+ 1 13.4
1	III.	"	Full brightness	"	"	7 0 43.4	
4	I.	"	First seen	"	"	15 22 48.2	+ 0 8.4
4	I.	"	Full brightness	"	"	15 25 49.2	
22	I.	"	First seen	"	"	8 7 55.1	+ 0 7.3
22	I.	"	Full brightness	"	"	8 10 6.2	
24	II.	"	First seen	"	"	6 36 12.2	- 0 13.6

Day of Obs.	Sat.	Phenomena.	Phase.	Telescope.	Power.	Windsor Mean Time. h m s	Correction to N. Almanac. m s
April 24	II.	Ecl. R.	Full brightness	C.	180	6 38 7.9	
May	II.	"	First seen	"	"	9 13 13.4	- 0 2.4
	II.	"	Full brightness	"	"	9 15 22.1	
	I.	"	First seen	"	40	6 25 0.8	- 0 2.0
	II.	"	First seen	"	"	11 49 49.6	- 0 15.2
	II.	"	Full brightness	"	"	11 52 37.1	
	III.	"	First seen	"	"	6 40 45.5	- 0 14.3
	III.	"	Full brightness	"	"	6 46 55.9	
	I.	"	First seen	"	"	8 19 42.2	+ 0 9.4
	III.	" D.	Fading	"	"	7 59 12.0	
	III.	"	Last seen	"	"	8 4 1.7	+ 3 48.9
	III.	" R.	First seen	"	"	10 39 18.3	+ 0 5.5
	III.	"	Full brightness	"	"	10 44 18.5	
	I.	Occ. D.	Ext. contact	G.	350	6 51 41.7	- 0 16.7
	I.	"	Total disapp.	"	"	6 55 7.2	
	I.	Ecl. R.	First seen	"	225	10 13 51.1	
	I.	"	Full brightness	"	"	10 15 38.8	
	I.	"	First seen	C.	40	6 37 17.7	- 0 8.1
	II.	Tr. Ingr.	Ext. contact	G.	170	5 40 14.3	
	II.	"	Int. contact	"	"	5 44 48.5	
	II.	" Egr.	Int. contact	"	"	8 24 50.9	

Day of Obs.	Sat.	Phenomena.	Phase.	Telescope.	Power.	Windsor Mean Time. h m s	Correction to N. Almanac. m s
June	25	II.	Ext. contact	G.	170	8 29 31.2	
	26	III.	First seen	"	"	6 29 16.7	- 0 48.1
	26	III.	Full brightness	"	"	6 34 21.9	
	27	II.	First seen	"	"	6 4 50.6	
	29	I.	Ext. contact	"	"	8 8 41.8	- 0 44.2
July	29	I.	Int. contact	"	"	8 11 26.4	
	3	III.	Fading	"	"	7 56 12.9	
	3	III.	Last seen	"	"	8 2 4.9	+ 5 25.1
	4	II.	First seen	"	"	8 41 11.1	- 0 19.7
	4	II.	Full brightness	"	"	8 43 14.2	
	10	III.	Ext. contact	"	225	6 46 2.4	
	10	III.	Total disapp.	"	"	6 55 55.7	
	11	II.	Ext. contact	"	"	6 7 5.0	
	11	II.	Total disapp.	"	"	6 11 39.2	
	28	III.	Ext. contact	"	175	5 15 22.2	
	28	III.	Int. contact	"	"	5 21 41.2	
	Aug.	8	III.	First seen	"	170	6 19 53.9
Aug.	8	III.	Full brightness	"	"	6 23 14.8	
	8	I.	First seen	"	"	7 17 5.4	+ 0 4.6
	8	I.	Full brightness	"	"	7 19 5.5	
	24	I.	First seen	"	130	5 36 0.0	+ 0 49.2

*Remarks.*

March 28.—Definition of Satellite I. not good; observation probably somewhat late. IV. growing faint at  $14^h 37^m 26^s$ , and I thought I could just glimpse it again at  $14^h 39^m 20^s.8$ . Satellite first noted at  $16^h 28^m 4.7^s$ , but I was quite certain of it 57 seconds later.

April 1.—Fair definition; satellite suspected 32 seconds before recorded time.

April 4.—Clear, but definition bad and images tremulous.

April 22.—Good definition and observation.

April 24.—Beautifully clear and definition excellent; very good observation.

May 1.—Images steady and definition excellent; good observation.

May 8.—Images steady and definition good; beautifully clear. The observation of the first appearance of II. probably rather late.

May 14.—Beautifully clear and definition good.

May 15.—Good definition, but sky overspread with thin cloud.

May 21.—Beautifully clear. Definition very good at disappearance, but images rather tremulous at reappearance. Defalcation of light marked at  $7^h 59^m 45^s.9$ . Satellite suspected a few seconds before recorded time of first appearance.

May 22.—Definition excellent throughout.

May 31.—Beautifully clear and definition good.

June 25.—Definition fair at ingress, but not so good at egress.

June 26.—Images steady, and definition unusually good.

June 27.—Beautifully clear, images steady and well defined; good observation.

June 29.—Bad definition.

July 3.—Definition excellent, with clear sky.

July 4.—Clear, but with bad definition.

July 10.—Fair definition.

July 11.—Clear; definition fair, but images tremulous.

July 28.—Definition not good enough for a higher power. Satellite barely visible as a light spot at  $5^h 29^m 10^s$ , and quite invisible at  $5^h 53^m 36^s$ . At  $6^h 32^m 30^s$  pretty conspicuous as a dark, not black, hazy spot; it had then nearly reached mid-transit, and was rather more than half the planet's semi-diameter distant from the planet's centre. Clouds prevented further observation.

August 8.—Beautifully clear, but with poor definition. Satellite III. suspected 10 seconds before recorded time of first appearance. Image of I. tremulous, with bad definition.

August 24.—Beautifully clear, but twilight very strong. Sun's upper limb disappeared behind the horizon  $6^m 53^s$  before the recorded time of reappearance. Image steady and definition good.

*Windsor, N.S. Wales: 1886, Sept. 28.*

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*Newall's Occulter.* By R. S. Newall, F.R.S.

I lately designed, and had made by a clever local optician, an addition to the eyepiece of my telescope, which I find of the greatest advantage in examining the satellites of planets and multiple stars.

My idea was to produce an instrument exactly the reverse of Dawes's solar eyepiece; that is, to interpose a screen which shall shut off the bright object, and thus allow of the faint companions being more easily seen, and, at the same time, the

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